

## CLAIMS

We Claim:

- 1           1. A light generating device comprising:  
2           a light emitting device; and,  
3           an epoxy placed over the light emitting device, the epoxy including:  
4                 a first type of phosphor, and  
5                 a second type of phosphor;  
6           wherein the first type of phosphor, when excited, emits light of a first  
7   color;  
8           wherein the second type of phosphor, when excited, emits light of a  
9   second color; and,  
10          wherein the first color and the second color are different.
  
- 1           2. A light generating device as in claim 1 wherein the light emitting  
2   device is a blue light emitting diode, wherein the first type of phosphor is a  
3   green phosphor, and wherein the second type of phosphor is a yellow phosphor.
  
- 1           3. A light generating device as in claim 1:  
2           wherein the light emitting device is a blue light emitting diode;  
3           wherein the first type of phosphor is one of the following:  
4                 Strontium Thiogallate:Europium, having a chemical formula of  
5    $\text{SrGa}_2\text{S}_4:\text{Eu}$ ,

6 a thiogallate phosphor that is a mix group II alkaline metal  
7 thiogallate phosphor (Sr,Ca,Ba)(Al,Ga)<sub>2</sub>S<sub>4</sub>:Eu; BaSrGa<sub>4</sub>S<sub>7</sub>:Eu; and,  
8 wherein the second type of phosphor is a yellow phosphor having one of  
9 the following chemical formulas:

10 Tb<sub>3</sub>Al<sub>5</sub>O<sub>12</sub>:Ce,  
11 Sr(Ba,Ca)SiO<sub>4</sub>:Eu,  
12 YAG:Ce.

1 4. A light generating device as in claim 1 additionally comprises one of  
2 the following:

3 a mold compound covering the epoxy;  
4 an optical dome covering the epoxy.

1 5. A light generating device as in claim 1 wherein the first type of  
2 phosphor is a red phosphor, and wherein the second type of phosphor is a  
3 yellow phosphor.

1 6. A light generating device as in claim 1:  
2 wherein the first type of phosphor is a red phosphor having one of the  
3 following chemical formulas:

4 CaS:Eu<sup>2+</sup>,Mn<sup>2+</sup>,  
5 SrS:Eu<sup>2+</sup>,  
6 (Zn,Cd)S:Ag<sup>+</sup>,

Mg<sub>4</sub>GeO<sub>5.5</sub>F:Mn<sup>4+</sup>,  
ZnS: Cu<sup>+</sup>,  
ZnSe:Cu, Cl,  
ZnSe<sub>1/2</sub>Si<sub>1/2</sub>:Cu,Cl,  
BaSi<sub>7</sub>N<sub>10</sub>:Eu<sup>2+</sup>,  
(Ca,Sr,Ba)Si<sub>5</sub>N<sub>8</sub>:Eu<sup>2+</sup>; and,

wherein the second type of phosphor is a yellow phosphor having one of the following chemical formulas:

Tb<sub>3</sub>Al<sub>5</sub>O<sub>12</sub>:Ce,  
Sr(Ba,Ca)SiO<sub>4</sub>:Eu,  
YAG:Ce.

7. A light generating device as in claim 1 additionally comprising:  
a second light emitting device; and,  
a second epoxy placed over the second light emitting device, the second epoxy including:  
the first type of phosphor, and  
the second type of phosphor.

8. A light generating device as in claim 1 additionally comprising:  
a second light emitting device;  
a second epoxy placed over the second light emitting device, the second epoxy including:

5                   the first type of phosphor, and  
6                   the second type of phosphor;  
7           a third light emitting device; and,  
8           a third epoxy placed over the third light emitting device, the third epoxy  
9 including:

10                   the first type of phosphor, and  
11                   the second type of phosphor.

1           9. A light generating device as in claim 1, wherein the light emitting  
2 device is mounted on one of the following:

3           a printed circuit board;  
4           a lead frame.

1           10. A light generating device as in claim 1, wherein the light emitting  
2 device is mounted within a printed circuit board substrate.

1           11. A method for generating colored light comprising:  
2           emitting light from a light emitting device; and,  
3           combining light emitted from light emitting device with light from a first  
4 type of phosphor and a second type of phosphor, the first type of phosphor and  
5 the second type of phosphor being within an epoxy placed over the light  
6 emitting device, wherein the first type of phosphor, when excited, emits light of

7 a first color, wherein the second type of phosphor, when excited, emits light of a  
8 second color, and wherein the first color and the second color are different.

1 12. A method as in claim 11 wherein the light emitting device is a blue  
2 light emitting diode, wherein the first type of phosphor is a green phosphor,  
3 and wherein the second type of phosphor is a yellow phosphor.

1 13. A method as in claim 11:

2 wherein the light emitting device is a blue light emitting diode;

3 wherein the first type of phosphor is one of the following:

4 Strontium Thiogallate:Europium, having a chemical formula of  
5  $\text{SrGa}_2\text{S}_4:\text{Eu}$ ;

6 a thiogallate phosphor that is a mix group II alkaline metal  
7 thiogallate phosphor  $(\text{Sr}, \text{Ca}, \text{Ba})(\text{Al}, \text{Ga})_2\text{S}_4:\text{Eu}$ ;  $\text{BaSrGa}_4\text{S}_7:\text{Eu}$ ; and,

8 wherein the second type of phosphor is a yellow phosphor having one of  
9 the following chemical formulas:

10  $\text{Tb}_3\text{Al}_5\text{O}_{12}:\text{Ce}$ ,

11  $\text{Sr}(\text{Ba}, \text{Ca})\text{SiO}_4:\text{Eu}$ ,

12  $\text{YAG}:\text{Ce}$ .

1 14. A light generating device comprising:

2 an emitting means for emitting light; and,

3 an holding means for holding a first type of phosphor and a second type  
4 of phosphor adjacent to the emitting means;  
5 wherein the first type of phosphor, when excited, emits light of a first  
6 color;  
7 wherein the second type of phosphor, when excited, emits light of a  
8 second color; and,  
9 wherein the first color and the second color are different.

1 15. A light generating device as in claim 14 wherein the emitting means is  
2 a blue light emitting diode, wherein the first type of phosphor is a green  
3 phosphor, and wherein the second type of phosphor is a yellow phosphor.

1 16. A light generating device as in claim 14:  
2 wherein the emitting means is a blue light emitting diode;  
3 wherein the first type of phosphor is one of the following:  
4 Strontium Thiogallate:Europium, having a chemical formula of  
5  $\text{SrGa}_2\text{S}_4:\text{Eu}$ ;  
6 a thiogallate phosphor that is a mix group II alkaline metal  
7 thiogallate phosphor  $(\text{Sr},\text{Ca},\text{Ba})(\text{Al},\text{Ga})_2\text{S}_4:\text{Eu}$ ;  $\text{BaSrGa}_4\text{S}_7:\text{Eu}$ ; and,  
8 wherein the second type of phosphor is a yellow phosphor having one of  
9 the following chemical formulas:  
10  $\text{Tb}_3\text{Al}_5\text{O}_{12}:\text{Ce}$ ,  
11  $\text{Sr}(\text{Ba},\text{Ca})\text{SiO}_4:\text{Eu}$ ,

12                   YAG:Ce.

1           17. A light generating device as in claim 16 wherein the first type of  
2   phosphor is a red phosphor, and wherein the second type of phosphor is a  
3   yellow phosphor.

1           18. A light generating device as in claim 16:  
2           wherein the first type of phosphor is a red phosphor having one of the  
3   following chemical formulas:

4                   CaS:Eu<sup>2+</sup>,Mn<sup>2+</sup>,

5                   SrS:Eu<sup>2+</sup>,

6                   (Zn,Cd)S:Ag<sup>+</sup>,

7                   Mg<sub>4</sub>GeO<sub>5.5</sub>F:Mn<sup>4+</sup>,

8                   ZnS: Cu<sup>+</sup>,

9                   ZnSe:Cu, Cl

10                  ZnSe<sub>1/2</sub>Si<sub>1/2</sub>:Cu,Cl,

11                  BaSi<sub>7</sub>N<sub>10</sub>:Eu<sup>2+</sup>,

12                  (Ca,Sr,Ba)Si<sub>5</sub>N<sub>8</sub>:Eu<sup>2+</sup>; and,

13                  wherein the second type of phosphor is a yellow phosphor having one of  
14   the following chemical formulas:

15                  Tb<sub>3</sub>Al<sub>5</sub>O<sub>12</sub>:Ce,

16                  Sr(Ba,Ca)SiO<sub>4</sub>:Eu,

17                  YAG:Ce.

1           19. A light generating device as in claim 14, wherein the emitting means  
2 is mounted on one of the following:  
3           a printed circuit board;  
4           a lead frame.

1           20. A light generating device as in claim 14, wherein the emitting means  
2 is mounted within a printed circuit board substrate.